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## TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/748,174
Filing Date	December 31, 2003
Inventor(s)	Lukas TROSMAN, et al.
Group Art Unit	3663
Examiner Name	Alexandra F. AWAI
Attorney Docket Number	24GA127099

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<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		<b>Revised Appeal Brief in Response to Non-Compliant Appeal Brief Communication</b>

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name Matthew J. Lattig	Reg. No. 45,274
Signature			
Date	September 28, 2006		



(HDP Ref: 8564-000031/US)

**IN THE U.S. PATENT AND TRADEMARK OFFICE**

Appellants: Lukas TROSMAN, et al.  
Application No.: 10/748,174  
Art Unit: 3663  
Filed: December 31, 2003  
Examiner: Alexandra F. AWAI  
For: DISTRIBUTED CLUMPING OF PART-LENGTH FUEL RODS  
FOR A REACTOR FUEL BUNDLE  
Attorney Docket No.: 24GA127099  
Conf. No.: 5555

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September 28, 2006

**REVISED APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 41.37**

Dear Sir:

In reply to the notification of Non-Compliant Appeal Brief mailed September 1, 2006, Appellants submit herewith their revised Brief on Appeal as required by 37 C.F.R. §41.37.

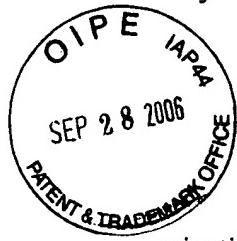


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## **REVISED APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 41.37**

In support of the Notice of Appeal filed May 16, 2006, appealing the Examiner's final rejection mailed April 20, 2006 of each of the claims appearing in the attached claims appendix (Appendix IX), Appellants hereby provide the following remarks.

This is a revised Appeal Brief to correct sections V (Summary of claimed Subject Matter), VI &, VII (remove claim 25 from these sections), X and XI (add as separate Appendices), per the notification of Non-Compliant Appeal Brief mailed to Appellants representative on September 1, 2006.

### **I. REAL PARTY IN INTEREST**

The real party in interest in this appeal is Global Nuclear Fuel-Americas, LLC, as reflected in the assignment recorded at reel 014854, frame 0816.

### **II. RELATED APPEALS AND INTERFERENCES**

A related Appeal is pending in Application Ser. No. 10/748,175. The Notice of Appeal was filed May 15, 2006. The related Appeal Brief filed August 15, 2006 may have a bearing on the Board's decision in this Appeal.

### **III. STATUS OF CLAIMS**

Claims 24, 26-29 and 31-33 are pending in the application, with claims 24, 28 and 31 being in independent form. Claims 1-23, 25 and 30 have been previously cancelled. Each of claims 24, 26-29 and 31-33 remain finally rejected and are being appealed.

#### **IV. STATUS OF AMENDMENTS**

An amendment after filing a Notice of Appeal under 37 C.F.R. §41.33 was filed August 10, 2006. As of the date of filing of this Appeal Brief, the Examiner had not acted on the amendment. The amendment was made to claims 24, 26, 28, 29 and 32 to comply with requirements of form expressly set forth by the Examiner on pages 3 and 4 of the Final Office Action mailed April 20, 2006, and to cancel claim 25 to reduce issues for Appeal.

As Appellants' presume that this amendment will be entered by the Examiner for purposes of Appeal (since the amendment was made to correct matters of form and/or to reduce issues at Appeal), the Claims Appendix reflects claims 24, 26-29 and 31-33 as amended in the August 10, 2006 submittal.

#### **V. SUMMARY OF CLAIMED SUBJECT MATTER**

##### **A. Independent Claim 24.**

Example embodiments of the present invention are related to a fuel rod configuration for a fuel bundle including both part-length and full-length fuel rods. In one example as shown in FIG. 2, which is a cross-section of the fuel bundle 10, there is shown a 10x10 fuel bundle matrix in which part-length fuel rods 20 are arranged in two groups. The first rod group 38 is arranged adjacent to the water passages 36. As can be seen in FIG. 2, each subgroup 38 (or subset) comprises three part-length fuel rods in a triangular orientation, with one rod of the subset closer to the longitudinal center line between the two water passages 36 than the other two rods of the subgroup 38 and directly adjacent to the other two rods of the subgroup 38.

Accordingly, claim 24 recites a fuel bundle 10 for a boiling water reactor which includes: a generally square, hollow tube having four sides (see FIG. 2) which are configured as sides of the bundle 10. The bundle 10 includes a pair of circular-shaped water passages 36 located adjacent to a longitudinal centerline 37 of the tube so as to extend centrally through the tube, the pair of water passages 36 supported by one or more rod supports 22, 24, 26.<sup>1</sup>.

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<sup>1</sup> See also Appellants' specification, paragraph [0016] and FIG. 1.

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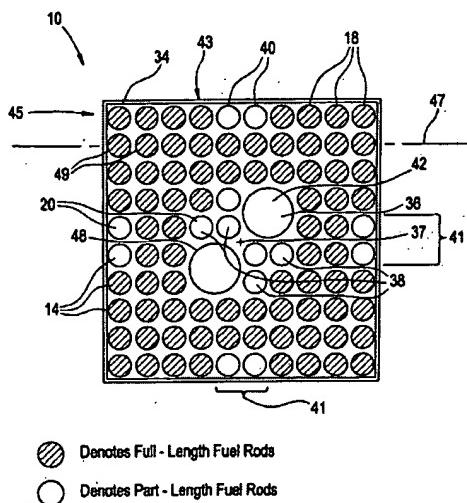
The bundle 10 includes a plurality of fuel rods 18, 20 arranged in a 10x10 matrix (FIG. 2) and including full-length rods 18 and part-length rods 20.

As shown below in FIG. 2 below, the part-length rods 20 further comprise a first part-length rod group 38 including two subsets in a mirror-image relationship along the centerline 37 between the two water passages 36, each subset further comprising three part-length fuel rods 20 in a triangular orientation with one rod 20 of the subset closer to the longitudinal centerline 37 between the two water passages 36 than the other two rods 20 of the subset and directly adjacent to the other two rods of the subset.

As shown below in FIG. 2 below, the part-length rods 20 further comprise a second part-length rod group 40 including four pairs 41 of part-length rods 20, each part-length rod pair centrally located in the outermost row or column of the 10x10 matrix adjacent a corresponding one of the four sides of the tube.

There are a total of 14 part-length rods in the fuel assembly 10 of FIG. 2.

FIG. 2



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FIG. 2) bounded by four sides 34 of a generally square, hollow tube<sup>2</sup>, the fuel rods including full-length 18 and part-length fuel rods 20.

The 10X10 fuel-rod matrix includes two 3-rod subsets (see groups 38) consisting of part-length rods 20 in a mirror image relationship with one another along the longitudinal centerline 37 between the two water passages 36, each 3-rod subset configured in a triangular orientation (see FIG. 2) and directly adjacent to the pair of water passages 36 such that one rod 20 of the 3-rod subset (subgroup 38) is closer to the centerline 37 than the other two rods 20 and directly adjacent to the other two rods 20.

Still referring to FIG. 2 above, the 10X10 fuel-rod matrix includes eight additional part-length rods 20 arranged in four pairs 41, each pair 41 centrally located on an outermost row or column of the matrix nearest a corresponding one of the tube sides.

The arrangement in FIG. 2, (as recited in either claims 24 or 28) may potentially increase an overall neutron absorption rate using the two part-length rod groups in the particular orientation. This may provide improved shutdown margin for a boiling water reactor including such a fuel assembly arrangement. In one example, the improved shutdown margin may result by locally increasing the size of the water traps or voids that are above the part-length fuel rods, by pairing or grouping these fuel rods together as shown in FIG. 2 along the outermost ring of periphery of the fuel bundle and in a facing mirror image relationship adjacent the two water passages 36.<sup>3</sup>

### C. Independent Claim 31

Referring to FIG. 3, claim 31 recites a fuel assembly 100 having a single, square-shaped water passage 106 located off-center within a 10x10 fuel-rod matrix bounded by four sides 110 of a generally square, hollow tube (shown at 108). The fuel rods include full-length 102 and part-length fuel rods 104.

The 10X10 fuel-rod matrix includes a first rod group 112 comprising two pairs of part-length rods 104 arranged on either side of a corner of the square water-passage 106, and a second

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<sup>2</sup> Appellants specification, paragraph [0018]; the tube is formed by the walls 34 and also is referred to as a channel 12 in FIG. 1. In prosecution, the Examiner suggested using "tube" as more accurate.

<sup>3</sup> Appellants specification, paragraph [0024].

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rod group 114 comprising two pairs 114, 116 of part-length rods 104 and at least two non-paired part-length rods 118 (see also the two non-paired part-length rods on left edge of bundle 100 in FIG. 3). Each of the two pairs 114, 116 and the at least two non-paired part-length rods 118 are located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube, as shown in FIG. 3. There are a total of 11 part-length rods in the fuel assembly 100 of FIG. 3.

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Whether claims 24, 26-29 and 31-33 are unpatentable under 35 U.S.C. §103(a) over Orii et al. (USP 6,735,267, hereafter "Orii") in view of Ueda et al. (USP 5,068,082, hereafter "Ueda") and Johansson et al. (USP 5,229,068, hereafter Johansson).

## **VII. ARGUMENT**

**Claims 24, 26-29 and 31-33 are not rendered obvious under 35 U.S.C. §103(a) as being unpatentable over Orii in view of Ueda and Johansson.**

### **A. 35 U.S.C. §103(a) Rejection of Claims 24, 26, 28 and 29**

Appellants respectfully submit that Orii, single or in combination with Ueda, fail to teach or suggest a fuel bundle for a boiling water reactor, comprising at least:

A first part-length rod group including two subsets and a mirror-image relationship along the center line between the two water passages, each subset filter comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the rods to the center line between the two water passages than the other two rods of the subset and directly adjacent to the other two rods of the subset;

in combination with the other features of independent claim 24; and/or a fuel bundle for a boiling water reactor comprising at least:

A 10x10 fuel rod matrix which includes two 3-rod subsets consisting of part-length rods and a mirror-image relationship with one another along the longitudinal center line between the two water passages, each 3-rod subset configured in a triangular

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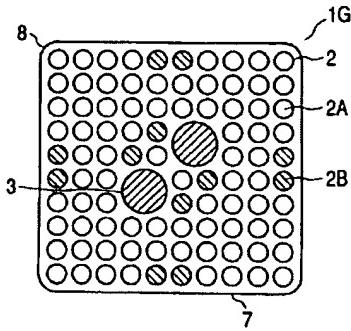
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orientation and directly adjacent to the pair of water passages such that one rod of the 3-rod subset is closer to the center line than the other two rods and directly adjacent to the other two rods, and comprising eight additional part-length rods arranged in four pairs, each pair centrally located on an outermost row or column of the matrix...;

as recited in independent claim 28. The Examiner relies on FIG. 15 of Orii as the primary reference. As shown below, FIG. 15 is a fourth embodiment of Orii and illustrates a pair of short rods arranged on each side of the outermost tier of the fuel rod array. In FIG. 15, fuel rods of the short-length fuel rods 2B in the middle portion of each side of the outermost ring. Also in FIG. 15 near a centerline between two water passages 3 are provided two (2) pairs of facing short-length rods in mirror relation to one another.

*FIG. 15*



However, in FIG. 15 of Orii, there is not shown or described the claimed 3-rod subsets in mirror image relationship with each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages since that one rod of the 3-rod subset is closer to the center line than the other two rods and directly adjacent to the other two rods, as recited in each claims 24 and 28. Yet, the Examiner has relied on FIG. 19 of Ueda for this alleged teaching.

Referring to FIG. 19, there is shown four, 4 x 4 sub-bundles arranged around a cruciform-shaped water channel 39. Each sub-bundle 38 includes a triangular orientation of part-length rods P 22 located near the center of the cruciform water channel 39. The four sub-bundles 38 of FIG. 19 approximate a 8x8 fuel assembly, and apparently have an effect of increasing the

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effective multiplication factor at a high temperature operation period and reduce the effect of multiplication factor at a low temperature operation. (*i.e.*, large shutdown margin).<sup>4</sup>

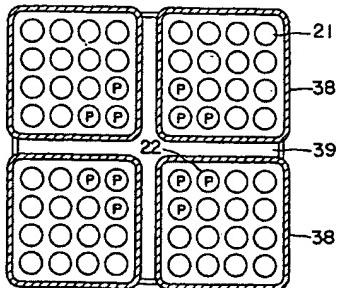


FIG. 19

The Examiner alleges that it would be obvious to combine the four sub-bundle arrangement as shown in Ueda's 8x8 matrix of FIG. 19 with Orii's 10x10 matrix FIG. 15. However, the sub-bundle arrangement in FIG. 19 of Ueda has a completely different fuel rod arrangement, water channel arrangement and includes four sets of short-length rods around each adjacent edge of the channel 39. Therefore, Appellants submit that it would not be obvious, and not make sense, to modify Orii's FIG. 15 with the arrangement shown in Ueda's FIG. 19, as the two fuel bundle matrices are completely different structures, have a completely different arrangement of part-length rods around different water channel configurations which are not compatible with each other.

Thus, from a mechanical standpoint it would not make sense to one skilled in the art to look to the structure of Ueda's FIG. 19 to pick a partial-length rod arrangement around a center cruciform channel, to incorporate in the 10x10 fuel rod matrix of FIG. 15. As it would not be technically feasible to combine these two references, Applicants submit that the rejection is improper.

Moreover, it does not appear the Examiner has made out a *prima facie* case of obviousness, and/or has utilized hindsight, reasoning and hence has not provided evidentiary support of motivation to combine Ueda with Orii, as to be set forth more fully below.

<sup>4</sup>

See Ueda, column 12, lines 53-66.

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**1. Rejection fails test for establishing prima facie case of obviousness.**

Appellants direct the Examiner's attention to two cases decided by the Court of Appeals for the Federal Circuit (CAFC), In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed.Cir. 1999) and In re Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed.Cir. 2000). Both of these cases set forth very rigorous requirements for establishing a prima facie case of obviousness under 35 U.S.C. §103(a). To establish obviousness based on a combination of elements disclosed in the prior art, there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant. The motivation suggestion or teaching may come explicitly from one of the following:

- (a) the statements in the prior art (patents themselves)
- (b) the knowledge of one of ordinary skill art, or in some cases,
- (c) the nature of the problem to be solved.

See Dembiczak 50 USPQ at 1614 (Fed.Cir. 1999). In Kotzab, the CAFC held that even though various elements of the claimed invention were present (in two separate embodiments of the same prior art reference), there was no motivation to combine the elements from the separate embodiments, based on the teachings in the prior art.

For example, and particularly with regard to dependent claims 26 and 29, the Examiner refers to a completely separate embodiment of Ueda (FIGs. 25A-D), but provides no motivation for combining this embodiment with Ueda FIG. 19 and Orii FIG. 15. The 9x9 fuel bundle design of FIGS. 25A-D in Ueda is completely different (see size and water passage location) from the 8x8 matrix of sub-bundles in Ueda FIG. 19.

In order to establish a prima facie case of obviousness under 35 U.S.C. §103(a), the Examiner must provide particular findings as to why the two pieces of prior art are combinable. See Dembiczak 50 USPQ2d at 1617. Broad conclusory statements standing alone are not "evidence".

In order to provide motivation for combining Ueda with Orii to reject presumably all claims (inclusive of independent claims 24 and 28) on page 7 of the Office Action of April 20, 2006, the Examiner asserts:

It would have been obvious to one skilled in the art at the time of the invention to combine the aforementioned teachings [e.g., by

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placing a 3-rod group taught by Ueda, et al. in the configuration taught by Orii, et al.] in order to provide the benefits that are disclosed objects of all the referenced prior art, particularly an improved shutdown margin, as part of an optimization of a known technology.

Appellants have read the entirety of Orii and Ueda and do not see how reading these references one of ordinary skill in art would think to combine Ueda's FIG. 19 with Orii's FIG. 15. For example, Orii is directed to a completely different fuel assembly configuration, a 10x10 matrix with two central circular water passages there through. On the other hand, Ueda is directed to an 8x8 matrix comprised of four sub-bundles 38 around a single, cruciform-shaped water channel. Neither Ueda nor Orii teach or suggest the significance of the part-length rods in the vicinity of the water passages. The primary focus of Orii is to increase burnup without increasing pressure loss. The primary focus of Ueda is to ensure the maintenance of reactor shutdown margin and to improve the axial power distribution. One skilled in the art cannot discern, without substantial undue experimentation, whether adding an additional part-length rod in place of the fuel-length rod in FIG. 15 of Orii, would in fact improve shutdown margin in the Orii fuel bundle, or improve the effect of a void coefficient, or further increase burn-up without increasing the pressure loss.

Further, since there are two distinctly differently fuel bundle structures and water channel configurations in the two references, modification of one reference with the other would essentially destroy the combination. This is because the Examiner has merely selected Orii as a blueprint based on Appellants' FIG. 2, and looked for specific 3-rod subsets in any type of fuel bundle orientation to insert in place of Orii's two pairs of part-length rods in facing relationship at the water passages.

Accordingly, Appellants respectfully submit that independent claims 24 and 28 (and claims 26 and 29 dependent thereon) are allowable at least because the Examiner has failed to establish a proper prima facie case of obviousness under 35 U.S.C. 103(a), in view of Dembiczak and Kotzab.

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**2. Examiner using Impermissible Hindsight.**

The Examiner is using impermissible hindsight reconstruction to reject the claims. At least for claims 24 and 29, the Examiner has used FIG. 2 of the present application as a blueprint, selected a prior art fuel assembly (Orii, FIG. 15) as the main structural device, and then searched other prior art for the missing elements without identifying or discussing any specific evidence of motivation to combine, other than providing conclusory statements regarding the knowledge in the art, motivation and obviousness.

For example, the Examiner alleges that the inclusion of a third rod is no more than a duplication of parts. This makes no sense with regard to the present claimed subject matter, since added a part-length rod at the water channel will change the characteristics of shutdown margin (SDM). The allegation that “part-length rods serve to ensure the maintenance of the reactor shut-down margin”, is not necessarily true; because it is the particular combination of groups or arrangements of part-length rods with intermediate and/or full-length rods which affects characteristics of reactor shut-down margin, not merely having part-length rods in the bundle.

Thus, it is evident that the Examiner simply looked for any fuel bundle arrangement which had a triangular orientation of part-length rods somewhere in the vicinity of a water channel to insert into the Orii embodiment of FIG. 15. Appellants further cannot tell from what basis the Examiner alleges that one would be motivated to modify Orii, other than an unfounded assertion that “a skilled artisan desiring to duplicate the effect of one of the rods in a 2-rod subset in the interest of modulating the shut-down margin would be motive to provide a 3-rod subset.” That statement is without evidentiary basis and without actual support.

The Federal Circuit has noted that the PTO and the courts "cannot use hindsight reconstruction to **pick and choose among isolated disclosures in the prior art to deprecate the claimed invention,**" In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988), and that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement for a showing of a teaching or motivation to combine the prior art references. Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. Dembiczak, 50 USPQ2d at 1617. Appellants

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respectfully submit that claims 24 and 28 (and claims 26 and 29 dependent thereon) are allowable for at least this additional reason.

**3. Examiner has not provided requisite motivation to combine references.**

The Examiner must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious."); In re Fritch, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (the examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references"). Accordingly, the Examiner has not adequately supported the selection and combination of Orii and Ueda to render obvious that which Appellants have recited in claims 24 and 28. The Examiner's conclusory statement as to motivation on page 7 of the Final Office Action, to obtain "particularly an improved shutdown margin, as part of an optimization of a known technology" does not adequately address the issue of motivation to combine a part-length rod arrangement shown in two, 4x4 sub-bundles of an 8x8 matrix having a cruciform-shaped moderator channel (Ueda, FIG. 19), with a single 10x10 fuel assembly having two central circular water channels (Orii, FIG. 15). Further, such an assertion of apparent improved shutdown margin is not rooted in fact, but is merely an unsupported generalization that the use of part length rods will create a larger shutdown margin.

Appellants submit that the Examiner's analysis is mere hand-waving, essentially alleging with an overbroad and inconclusive statement that "it is well known" that fuel assemblies with part length rods may help to moderate shutdown margin therein. The Examiner's logic follows that the combination of any fuel assembly design having mirror image 3-rod subsets, regardless of the water channel or fuel assembly configuration of the reference, when combined with Orii would hence be predictable (i.e., not unexpected), and/or that a skilled artisan desiring to duplicate the effect of Orii's two-rod subset in the interest of modulating shutdown margin "would be motivated to provide a 3-rod subset" (Page 6 of Final Office Action). This logic, without factual support, is improper.

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The Examiner has found no teaching of a 10x10 matrix fuel assembly with the specifically recited 3-rod part-length rod arrangement in mirror-image relationship around a pair of circular-shaped water passages located adjacent to a longitudinal centerline of the tube so as to extend centrally through the tube. The Examiner has resorted to Ueda's 4x4 sub-bundles of an 8x8 matrix with some semblance of the 3-rod part length arrangement near a cruciform water channel as a substitute to Orii. The apparent benefit or motivation cited by the Examiner on page 7 of the Office Action, "improved shutdown margin" is merely a generic statement that is unsupported in Orii or Ueda, and is simply a reconstitution of what is recited in the present application as a possible benefit to the arrangement in FIGS. 2 and 3. In other words, this statement provides no basis for motivation.

For example, the Examiner reliance on col. 12, lines 61-65 as to a large shutdown margin (office action, top of page 7) is limited to the specific embodiment of FIG. 19 in Ueda, and the passage fails to suggest any indication for using the specified arrangement of part length rods in a fuel assembly other than in the embodiment of FIG. 19.

The Examiner's reliance on Johannson to show that the use of part length rods lower pressure drop and hence improves critical power appears to be either an attempt to provide motivation for the Orii/Ueda combination or an attempt to tie in a routine experimentation argument under MPEP 2144.05 II A as to the use of part length rods. Johannson's teachings are not relevant to any motivation for combining the part-length rod arrangement in two of Ueda's 4X4 sub-bundles in FIG. 19 with Orii's 10x10 fuel assembly having two central circular water channels. Further, critical power is related to boiling transition during actual critical reactor operation, and not to shutdown margin; thus it unclear how Johannson is factually relevant to the Examiner's alleged motivation to combine Ueda with Orii on page 7 of the office action.

This factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher." W.L. Gore v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983). The Examiner must explain the reasoning behind his findings of motivation. Simply stating that the motivation for combining Orii and Ueda is "in order to provide the benefits that are the disclosed objects of all the referenced prior art,

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particularly an improved shutdown margin, as part of an optimization of a known technology" is an insufficient explanation for the alleged combination. It is unclear to Appellants what relevance or bearing such optimization has on the issue of motivation to combine Ueda with Orii. For at least these additional reasons, Appellants respectfully submit that claims 24, 26, 28 and 29 are allowable.

**B. 35 U.S.C. §103(a) Rejection of Claims 31 and 32**

With regard to independent claim 31 and claim 32 dependent thereon, Applicants submit that the Examiner has failed to provide a reference which teaches or suggests a fuel bundle with a 10x10 matrix, wherein the 10x10 fuel-rod matrix includes a first-rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-pair part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a porous bind outermost row or column of the matrix, as recited in claim 31.

The Examiner has not explicitly described where in Orii, Ueda and/or Johansson such a teaching of a fuel bundle is provided. Appellants cannot tell from the Examiner's Final Office Action if, in fact, these features were even considered by the Examiner in claim 31.

Accordingly, in the absence of any explicit prior art illustrating such features that are recited in the fuel bundle of claim 31, Appellants submit that each of claims 31 and 32 are allowable, and that the Examiner has provided no references which teach the features therein.

**C. 35 U.S.C. §103(a) Rejection of Claims 27 and 33**

With regard to claims 27 and 33, which recite specific numbers of the part-length rods in each of the fuel bundle assemblies shown in FIGS. 2 and 3, Appellants submit the Examiner has made no explicit teaching of a fuel bundle which has such an arrangement or number of part-length fuel rods. In fact, Appellants cannot determine where the Examiner had addressed the features in either of these claims. As such, since the Examiner has not provided a teaching or indication of a fuel assembly having this compliment of part-length fuel rods, Applicants submit that claims 27 and 33 are separately allowable for these additional reasons.

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### VIII. CONCLUSION

Appellants respectfully request the Board to reverse the Examiner's rejection of claims 24, 26-29 and 31-33 and allow each of these claims.

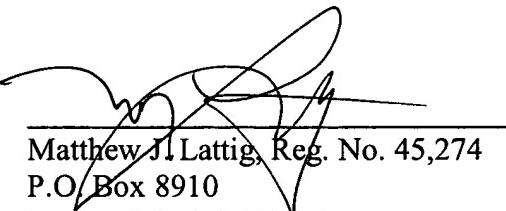
Pursuant to 37 C.F.R. § 1.17 and § 1.136(a), Applicants respectfully petition for a one (1) month extension of time for filing a response in connection with the present application, and the required fee of \$120.00 is attached.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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**IX. CLAIMS APPENDIX**

24. A fuel bundle for a boiling water reactor, comprising:

a generally square, hollow tube having four sides which are configured as sides of the bundle,

a pair of circular-shaped water passages located adjacent to a longitudinal centerline of the tube so as to extend centrally through the tube, the pair of water passages supported by one or more rod supports,

a plurality of fuel rods arranged in a 10x10 matrix and including full-length rods and part-length rods, the part-length rods further comprising:

a first part-length rod group including two subsets in a mirror-image relationship along the centerline between the two water passages, each subset further comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset and directly adjacent to the other two rods of the subset, and

a second part-length rod group including four pairs of part-length rods, each part-length rod pair centrally located in the outermost row or column of the 10x10 matrix adjacent a corresponding one of the four sides of the tube.

26. The fuel bundle of claim 24, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

27. The fuel bundle of claim 24, wherein there are a total of 14 part-length rods therein.

28. A fuel bundle for a boiling water reactor, comprising:

a pair of centrally located, circular-shaped water passages arranged on either side of a longitudinal centerline of the bundle within a 10X10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods,

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wherein the 10X10 fuel-rod matrix includes two 3-rod subsets consisting of part-length rods in a mirror image relationship with one another along the longitudinal centerline between the two water passages, each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages such that one rod of the 3-rod subset is closer to the centerline than the other two rods and directly adjacent to the other two rods, and comprising eight additional part-length rods arranged in four pairs, each pair centrally located on an outermost row or column of the matrix nearest a corresponding one of the tube sides.

29. The fuel bundle of claim 28, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

31. A fuel bundle for a boiling water reactor, comprising:

a single, square-shaped water passage located off-center within a 10x10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods,

wherein the 10X10 fuel-rod matrix includes a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-paired part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube.

32. The fuel bundle of claim 31, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

33. The fuel bundle of claim 31, wherein there are a total of eleven part-length rods within the 10X10 matrix.

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**X. EVIDENCE AND RELATED PROCEEDING APPENDICES**

As no evidence was submitted and relied upon in this Appeal, this Appendix contains no evidence pursuant to 37 C.F.R. §41.37(c)(1)(ix).

**XI. RELATED PROCEEDINGS APPENDIX**

As there are no related proceedings, copies of a decision rendered by a court or the Board for such proceedings do not exist and have not been supplied in an Appendix pursuant to 41.37(c)(1)(x).